UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/529,025	03/22/2005	Andreas Pachler	ZIP 3222	8882

7812 7590 11/10/2008

SMITH-HILL AND BEDELL, P.C.
16100 NW CORNELL ROAD, SUITE 220
BEAVERTON, OR 97006

EXAMINER	
GEBREMICHAEL, BRUK A	

ART UNIT	PAPER NUMBER
3715	

MAIL DATE	DELIVERY MODE
11/10/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/529,025	PACHLER, ANDREAS	
	Examiner	**Art Unit**	
	BRUK A. GEBREMICHAEL	3715	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 28 July 2008.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 23-36 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 23-36 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The following office action is a **Final Office Action** in response to communications received on 07/28/2008. Claims 12-22 have been cancelled. Claims 23-36 have been added. Therefore, claims 23-36 are pending in this application.

Response to Amendment

2. Applicant's amendment to the Abstract is sufficient to overcome the objection set forth in the previous office action. The Examiner withdraws the objection.

The Applicant has cancelled claims 13 and 14, and therefore, the Examiner withdraws the 35 U.S.C. 112, second paragraph rejection set forth in the previous office action.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

- Claims 23-36 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Independent claim 23 recites the limitation, "*the microcontroller measures change in average current supplied to the electromagnet, and the microcontroller controls supply of energizing current to the electromagnet in response to both an output*

signal of the magnetic field sensor and the measured change in average current supplied to the electromagnet", however, the specification does not teach *measuring the change in the average current*, or controlling the supply of the energizing current to the electromagnet in response to both the output signals of the magnetic field sensor and the *measured change in average current*, as claimed.

Similarly, independent claim 29 recites the limitation, "*measuring change in average current supplied to the electromagnet, and controlling the current supplied to the electromagnet in response to both the output signal of the magnetic field sensor and the measured change in average current*", here also, the specification does not teach *measuring the change in the average current*, or controlling the supply of the energizing current to the electromagnet in response to both the output signals of the magnetic field sensor and the *measured change in average current*, as claimed.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

- Claims 23-26, 29 and 32-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bowers 6,154,353 in view of Fisher 2003/0176144 and further in view of Bergstrom 6,249,418.

Regarding claim 23, Bowers discloses the following claimed limitations, a sphere (FIG 1, label O), a permanent magnet mounted on the sphere (FIG 1, label 10) and

interacting with the electromagnet, whereby the sphere is suspended magnetically from the support without contacting the support (col.1, lines 39-53), a magnetic field sensor that is stationary relative to the support (FIG 1, labels 15, 16), a microcontroller for controlling the position of the sphere by controlling supply of energizing current to the electromagnet (col.2, lines 3-10), and wherein the microcontroller has an input connected to the magnetic field sensor (FIG 2, labels 15, 16, 20), the microcontroller controls supply of energizing current to the electromagnet in response to both an output signal of the magnetic field sensor and the current supplied to the electromagnet (col.2, lines 3-10 and col.5, lines 46-57).

However, Bowers does not explicitly disclose, the globe comprising a globe sphere; a globe support; an electromagnet attached to the globe support; and the microcontroller measures change in average current supplied to the electromagnet.

Fisher teaches, a globe comprising a globe sphere (FIG 2B, label 30B); a globe support (FIG 2B, label 22); and an electromagnet attached to the globe support (see FIG 2B, label 24). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the invention of Bowers in view of Fisher by incorporating a “C” arm support structure for the globe sphere (FIG 2B) in order to float the sphere between the top part of the support arm and its base so that the sphere would mimic the orientation of the earth, thereby allowing the apparatus to use as a teaching or demonstrating device.

Bowers in view of Fisher does not teach, the microcontroller measures change in average current supplied to the electromagnet. However, Bergstrom teaches a

microcontroller that measures change in average current supplied to the electromagnet (col.5, lines 1-5).Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the invention of Bowers in view of Fisher and further in view of Bergstrom by incorporating a current sensor in the deice in order to allow the microprocessor to sample the average current through the sensor and use this information to compute an output signal such as a PWM (Pulse Width Modulation) that controls the state of an electronic switch (e.g. ON/OFF state of a transistor), which then monitors the amount of current in the coil of the electromagnet. As already suggested by Bergstrom, such practice makes the circuit easier to control.

Regarding claim 24, Bowers in view of Fisher and further in view of Bergstrom teaches the claimed limitations as discussed above.

Bowers further discloses, the magnetic field sensor is a Hall effect sensor attached to the globe support (col.2, lines 26-28).

Bergstrom further teaches, the globe further comprises an analog-to- digital converter for digitizing the output signal of the Hall effect sensor and providing the digital output signal to the input of the microcontroller (col.6, lines 10-16).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the invention of Bowers in view of Fisher and further in view of Bergstrom by including a digital-to-analog and an analog-to-digital converter in the apparatus in order to convent the analog output of the sensors into digital equivalents so that the microprocessor would use this digital information when

computing or calculating the control signals that monitor the amount of current flow in the coil of the electromagnet.

Regarding claim 25, Bowers in view of Fisher and further in view of Bergstrom teaches the claimed limitations as discussed above.

Bowers further discloses, the microcontroller generates an output signal for controlling energization of the electromagnet (col.2, lines 3-6) and the globe comprises a switch responsive to the output signal for controlling current flow through the electromagnet (col.2, lines 17-25).

Regarding claim 26, Bowers in view of Fisher and further in view of Bergstrom teaches the claimed limitations as discussed above.

Bowers further discloses, the microcontroller measures the average current by measuring the duty cycle of the electromagnet over a predetermined interval (FIG 3, *Duty cycle* with respect to I_A and I_R) and compares the measured value with a reference value and if the measured value exceeds the reference value and the magnetic field sensor indicates that the globe sphere is too far from the globe support relative to a desired position of the globe sphere, the microcontroller increases the duty cycle of the electromagnet (col.5, lines 43-57) whereas if the measured value of the duty cycle is less than the reference value and the output signal of the magnetic field sensor indicates that the globe sphere is too close to the globe support relative to the desired position of the globe sphere, the microcontroller reduces the duty cycle of the electromagnet (col.5, lines 58-62).

Regarding claim 29, Bowers discloses the following claimed limitations, a method

of controlling the position of a sphere that is suspended magnetically from a support by use of a permanent magnet mounted on the sphere and interacting with an electromagnet attached to the support (col.1, lines 40-46), the method comprising employing a magnetic field sensor that is stationary relative to the support to generate an output signal dependent on height of the sphere relative to the support (FIG 1, labels 15, 16), supplying energizing current to the electromagnet, whereby the permanent magnet is attracted towards the electromagnet (col.2, lines 3-10), and controlling the current supplied to the electromagnet in response to both the output signal of the magnetic field sensor and the current (col.2, lines 3-10 and col.5, lines 46-57).

However, Bowers does not disclose, a globe sphere; an electromagnet attached to the globe support; and measuring change in average current supplied to the electromagnet.

Fisher teaches, a globe sphere (FIG 2B, label 30B), a globe support (FIG 2B, label 22); and an electromagnet attached to the globe support (FIG 2B, label 24).

Therefore here also, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the invention of Bowers in view of Fisher by incorporating a “C” arm support structure for the globe sphere (FIG 2B) in order to float the sphere between the top part of the support arm and its base so that the sphere would mimic the orientation of the earth, thereby allowing the apparatus to use as a teaching or demonstrating device.

Bowers in view of Fisher does not teach, the microcontroller measures change in average current supplied to the electromagnet.

Bergstrom teaches a microcontroller that measures change in average current supplied to the electromagnet (col.5, lines 1-5).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the invention of Bowers in view of Fisher and further in view of Bergstrom by incorporating a current sensor in the deice in order to allow the microprocessor to sample the average current through the sensor and use this information to compute an output signal such as a PWM (Pulse Width Modulation) that controls the state of an electronic switch (e.g. ON/OFF state of a transistor), which then monitors the amount of current in the coil of the electromagnet. As already suggested by Bergstrom, such practice makes the circuit easier to control.

Bowers in view of Fisher and further in view of Bergstrom teaches the claimed limitations as discussed above. Bowers further discloses,

Regarding claim 32, measuring the average current by measuring the duty cycle of the electromagnet over a predetermined interval (see FIG 3, *Duty cycle* with respect to I_A, I_R), comparing the measured value with a reference value and if the measured value exceeds the reference value and the magnetic field sensor indicates that the globe sphere is too far from the globe support relative to a desired position of the globe sphere, increasing the duty cycle of the electromagnet (col.5, lines 43-57), whereas if the measured value of the duty cycle is less than the reference value and the output signal of the magnetic field sensor indicates that the globe sphere is too close to the globe support relative to the desired position of the globe sphere, reducing the duty cycle of the electromagnet (col.5, lines 58-62),

Regarding claim 33, employing a switch to control supply of energizing current to the electromagnet and utilizing the duty cycle of the electromagnet as a measure of average current (col.2, lines 17-25),

Regarding claim 34, comparing the duty cycle with a reference value and controlling supply of energizing current to the electromagnet in a manner such as to reduce difference between the duty cycle and the reference value (col.5, lines 43-57),

Regarding claims 35 and 36, deenergizing the electromagnet in the event that the output signal of the magnetic field sensor falls below a first threshold value, energizing the electromagnet in the event that the output signal of the magnetic field sensor exceeds a second threshold value (see Abstract and col.2, lines 17-25).

- Claims 27-28 and 30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bowers 6,154,353 in view of Fisher 2003/0176144, in view of Bergstrom 6,249,418 and further in view of Baker 6,373,676.

Regarding claims 27 and 31, Bowers in view of Fisher and further in view of Bergstrom teaches the claimed limitations as discussed above.

Bergstrom further teaches, the microcontroller includes a means for measuring the average current by measuring the duty cycle of the electromagnet over a time period (col.2, lines 21-30 and col.6, lines 48-57).

However, Bowers in view of Fisher and further in view of Bergstrom does not explicitly teach, comparing the measured value with a reference value, and changing the duty cycle in a manner to become more nearly equal to the reference value.

Baker teaches, comparing a measured value with a reference value, and changing the duty cycle in a manner to become more nearly equal to the reference value (col.3, lines 51-60).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the invention of Bowers in view of Fisher, in view of Bergstrom and further in view of Baker by storing a reference voltage signal in the microprocessor (memory of the microprocessor) in order to allow the microprocessor to calculate the control current by comparing the sensed signal with the stored reference, and transmit this calculated control current to the current generator to adjust the coil current of the electromagnet, thereby maintaining the object floating in the magnetic field without dropping .

Regarding claims 27 and 31, even if *Bowers in view of Fisher, in view of Bergstrom and further in view of Baker* does not explicitly teach, measuring the duty cycle of the electromagnet over a time period of *at least 10ms*, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to set a predetermined practical period since it has been held that when the general condition of the claimed subject matter (i.e. measuring the duty cycle for a given time period) is as disclosed in the prior art (e.g. see Baker col.5, lines 36-41), discovering an optimum range or a workable range involves only a routine skill in the art, and therefore this does not distinguish the current invention from the prior art (see In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955)).

Regarding claims 28 and 30, Bowers in view of Fisher and further in view of Bergstrom teaches the claimed limitations as discussed above.

However, Bowers in view of Fisher and further in view of Bergstrom does not explicitly teach, the microcontroller measures change in average current supplied to the electromagnet by measuring a first value of duty cycle of the electromagnet over a first interval, measuring a second value of duty cycle over a second interval, and calculating the difference between the first and second values.

Baker teaches, the microcontroller measures change in average current supplied to the electromagnet by measuring a first value of duty cycle of the electromagnet over a first interval, measuring a second value of duty cycle over a second interval, and calculating the difference between the first and second values (col.5, lines 36-45 and also see claims 12 and 13).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to modify the invention of Bowers in view of Fisher, in view of Bergstrom and further in view of Baker by programming an interrupt subroutine in the microprocessor in order to measure the coil current (dI) at predetermined intervals and calculate the moving average of the measured values so that the microprocessor would dynamically update (adjust) the control current that monitors the coil current of the electromagnet, thereby maintaining the object floating without dropping.

Response to Arguments.

5. Applicant's arguments filled on 07/28/2008 have been fully considered but they are not persuasive. In the remarks, Applicant argues that,

(1) Bowers et al does not disclose or suggest that the average current supplied to the electromagnet should be measured and that change in average current should be used to correct activation of the electromagnet to avoid oscillation of the object O.

The examiner relies on paragraph [0035] of Paden et al as disclosing a microcontroller comprising at least one register/counter for sensing the energized/deenergized status of an electromagnet and/or a device for sensing the current flow through an electromagnet, or the voltage at an electromagnet, over at least one defined time period. Applicant submits that the disclosure in paragraph [0035] of Paden et al is too broad and nonspecific to suggest anything of value to a person of ordinary skill in the art seeking to improve the magnetic suspension system disclosed by Bowers et al.

Fisher et al does not supply the deficiency in the disclosure of Bowers et al.

In view of the foregoing, applicant submits that the new independent claims 23 and 29 are patentable. It follows that the dependent claims also are patentable.

- In response to argument (1), as it has already been indicated in the above section (*Claim Rejections - 35 USC § 103*), the Bergstrom's reference teaches or suggests a microcontroller that measures the change in the average current. Please refer to the disclosure of Bergstrom's invention regarding the teaching of this claimed feature.

The Applicant further argued that the disclosure in paragraph [0035] of Paden et al is too broad and nonspecific to suggest anything of value to a person of ordinary skill in the art seeking to improve the magnetic suspension system disclosed by Bowers et.

As it was indicated in the previous office action, Paden's reference was used to teach Applicant's previous claimed feature, e.g. *a* ***microcontroller*** *comprising at least one* ***register/counter*** *for* ***sensing*** *the energized/deenergized status and/or a device for sensing the current flow through, or the voltage at, said electromagnet over* ***at least one defined time period***, and this claimed feature is clearly taught or suggested by Paden's invention. For example the line, "The **memory** 30 may also be **part of a CPU** or computer and may store executable files for driving the system and running various modules or algorithms. . . . The memory 30 may also store adjusted displacement outputs 28 or **estimated sensor outputs**. The adjusted displacement outputs 28 or estimated sensor outputs may be recalled from the memory 30 and **used to position the movable body** 12 to a point of substantial axial equilibrium during a reset, reboot, restart, or similar power up of the system 10." (Para.0035 lines 2-20), teaches that the CPU (i.e. the microcontroller) has memory (i.e. registers) for storing the sensed estimated sensor outputs. Here, it would have been obvious to one of ordinary skill in the art at the time of the invention was made to recognize the fact that the sensor outputs is a function of the energized/deenergized state of the electromagnet.

Paden further teaches that this sensing and storing sensor outputs is performed for *at least one definite period of time*. For example the line, "Estimating 54 the sensor offset includes **storing a plurality of displacement outputs** 24 **over a period of time**. The **period of time** may be **determined by comparing** a variance of the plurality of displacement outputs 24 against a **predetermined threshold** to determine a start time and an end time." (Para.0039, lines 1-6). Therefore, the Examiner concludes that

Paden's reference does teach or suggest Applicant's previously claimed feature, as discussed above.

Conclusion

Applicant's amendment necessitated the new grounds of rejection presented in this final office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filled within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Bruk A. Gebremichael whose telephone number is (571) 270-3079. The examiner can normally be reached on Monday to Friday (7:30AM-5:00PM) ALT. Friday OFF.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, THAI XUAN can be reached on (571) 272-7147. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Bruk A Gebremichael/
Examiner, Art Unit 3715

/Cameron Saadat/
Primary Examiner, Art Unit 3715